# MTBE (methyl tert-butyl ether) Groundwater Contamination

MTBE (methyl tert-butyl ether), a common fuel additive, is a chemical of concern at fuel releases sites, specifically those sites where releases have occurred since the early 1980's. Due to its high mobility and low natural degradation potential, MTBE often migrates farther and faster than other fuel components. Regulatory standards for MTBE in groundwater have yet to be set on a national level. However, preliminary guidelines and health advisories have suggested target levels in the low 5 - 40 ppb range based on both health and aesthetic considerations. MTBE contamination of groundwater has the potential to be a significant remediation issue for the US Air Force as well as for the rest of the nation.

**Background:**

MTBE is one of the primary components currently used in gasoline to meet the California Reformulated Gasoline Standards to reduce smog-forming emissions. It is also used either seasonally or year-round in parts of the country where concentrations of ozone in the summer, or carbon monoxide in the winter, exceed established air quality standards. MTBE is currently the oxygenate of choice of petroleum refineries seeking to meet the California Air Resources Board (CARB) Phase 2 Reformulated Gasoline regulations. This is due in part to its low cost, ease of production, and favorable transfer and blending characteristics. Petroleum refineries have used MTBE in gasoline to meet oxygenated fuel requirements since 1991 (oxygenated gasoline can contain up to 15 percent MTBE by volume) and as an anti-knock compound since 1979.

MTBE is highly soluble in water and thus very mobile in the subsurface. Treatment of MTBE-contaminated aquifers is difficult as its unique chemical properties render most conventional in-situ treatment approaches ineffective or impracticable. Currently, extraction and above-ground treatment is the only proven and reliable treatment option. However, this option is slow, maintenance-intensive, and costly. Preliminary American Petroleum Institute (API) estimates suggest that the presence of MTBE at a fuel release site could double the corrective action cost relative to a similar site without MTBE.

MTBE is being discovered with increasing frequency in municipal supply wells, irrigation wells, and groundwater monitoring wells across the country. In California, MTBE has recently been found in drinking water supply wells for the City of Santa Monica. The City has had to shut down all their wells and is currently trucking in fresh water from Los Angeles. A recent open file report by the US Geological Survey (USGS)noted detectable MTBE concentrations in 27 percent of shallow wells sampled in eight urban areas around the country. MTBE has also been found in drinking water systems in 10 northern states where MTBE has been used as either an octane booster or an oxygenate in gasoline. As more sampling of drinking water supplies and groundwater monitoring wells is performed specifically for MTBE, and the use of MTBE in oxygenated fuels increases, its occurrence in groundwater will likely be found to be more widespread than currently recognized.

Primary Maximum Contaminant Levels (MCL) include consideration of health risks. Cal/EPAs Office of Environmental Health Hazard Assessment has proposed a public health goal (PHG) of 14 ppb for MTBE. A proposed primary MCL is planned for release for public comment by spring 1999. The current "action level" is 35 ppb; however, the California Department of Health Services (DHS) will likely utilize the PHG in setting the primary MCL. The current United States Environmental Protection Agency (USEPA) advisory level for MTBE is 20 to 40 ppb; however they have appointed a 14-member group to conduct a six-month study to consider the health risk caused by MTBE.

Secondary MCLs address “aesthetic” qualities of drinking water supplies. In the case of MTBE, the purpose of the secondary MCL is to protect the public from exposure to MTBE in drinking water at levels that can be smelled or tasted. In recent studies, the “average” concentration at which the presence of MTBE was sensed was 14.5 ppb; however some panelists could taste MTBE at concentrations as low as 2 ppb. The California Department of Health Services (DHS) has adopted a secondary MCL of 5 ppb for MTBE. If approved by the California Office of Administrative Law, the regulation will become effective 30 days after filing with the Secretary of State.

California regulators are becoming increasingly concerned that there is no system presently in place to detect MTBE contamination of drinking water from leaking underground storage tanks. In response, they are moving to create mandatory MTBE sampling at all leaking underground storage tank (LUST) sites. The California DHS is starting to gather data from public water systems to determine how widespread the problem is in these systems. USEPA is considering issuing drinking water health advisories for MTBE where concentrations reach 20 to 200 ppb. For now, regulatory agencies are collecting information and not using MTBE as a site closure criteria. This could change as more information becomes available. On 30 Nov 1998, USEPA announced that a blue-ribbon panel of leading experts from the public health and scientific communities, automotive fuels industry, water utilities, and local and state government would be created to review the important issues posed by the use of MTBE and other fuel oxygenates..

The remediation of MTBE-impacted sites is of relevance to DoD as fuel is stored, transported, and/or dispensed at many military installations. MTBE has been identified at DoD facilities in 15 states, five of which were not known to use MTBE. It is anticipated that this number will increase dramatically when specific testing for MTBE is required. In recent years, DoD has encouraged and demonstrated the use of in-situ natural attenuation for the management of dissolved BTEX groundwater plumes at fuel spill sites. Until recently, this approach had been gaining acceptance in the regulatory community; however, with the increased awareness of MTBE and its potential to cause much more extensive impacts than BTEX, the acceptability of natural attenuation for sites containing MTBE is now being questioned by regulators. Without other practicable alternatives to extraction and above-ground treatment at MTBE-impacted groundwater sites, the use and acceptance of natural attenuation as a remediation / aquifer management option may become limited in the near future. This concern has recently been noted as a key issue by the DoD-sponsored Lawrence Livermore National Laboratory Risk-Based Corrective Action Expert Committee that has reviewed corrective action plans for 10 DoD LUST sites in California.

**Strategy:**

This issue is of relevance to the Air Force and DoD, as well as US EPA, state regulatory agencies, and the gasoline refining and marketing industry. The Air Force and DoD should participate with these agencies in research efforts seeking practical solutions to this problem. In addition, the Air Force and DoD should closely monitor the private sector efforts in this area and follow the established direction to the maximum extent possible.